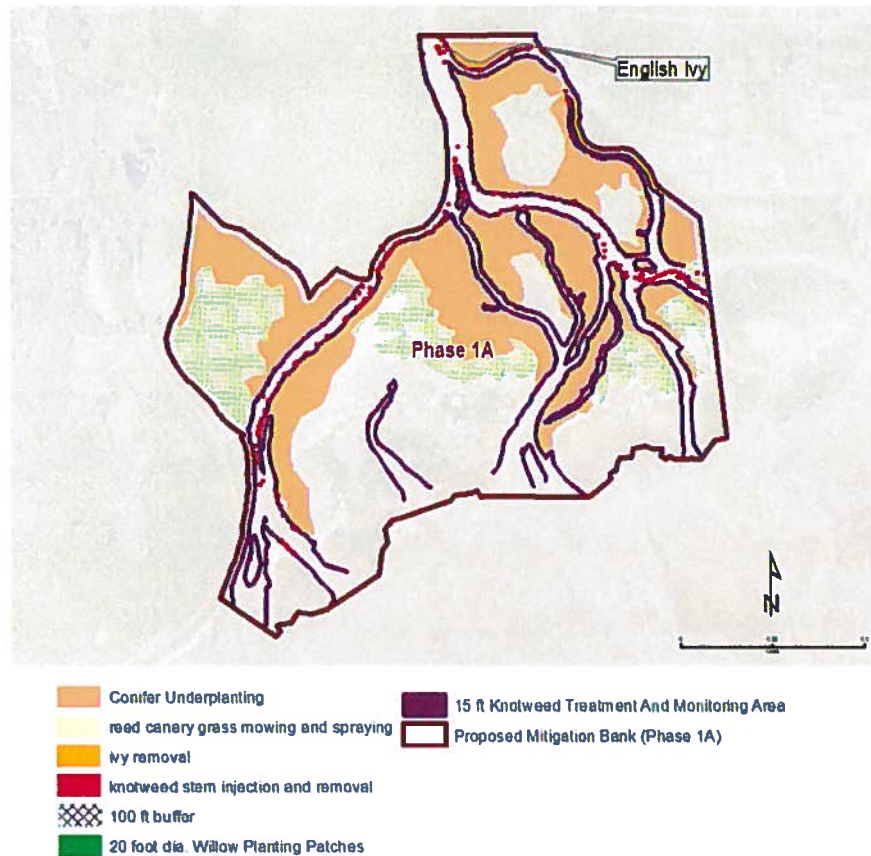


**Lummi Nation Wetland and Habitat Mitigation Bank**  
**2012 As-Planted Report**  
**Phase 1A Nooksack Delta Site**



**Prepared For:**

Interagency Review Team – Lummi Nation Wetland and Habitat Mitigation Bank

**Prepared By:**

Jeremy Freimund, P.H.	Lummi Nation Water Resources Manager
Michael Muscari, PWS	ESA Senior Wetland Ecologist
Frank Lawrence III	Lummi Nation Water Resources Specialist
Gerry Gabrisch	Lummi Nation GIS Manager
Craig Dolphin	Lummi Nation Database Manager

**September 2014**



## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	1
INTRODUCTION .....	2
PHASE 1A DESIGN PLAN SUMMARY .....	2
BANK OBJECTIVES AND PERFORMANCE STANDARDS .....	3
PHASE 1A WORK COMPLETED IN 2012 (YEAR 1).....	4
Reed Canarygrass/Yellow Flag Iris Treatment and Willow Plantings .....	5
Conifer Underplanting .....	9
Knotweed Control.....	10
FIGURES .....	11
APPENDIX A: INVOICES	
APPENDIX B: YEAR 0 SHRUB PLOT DIAMETERS	

## LIST OF FIGURES

Figure 1. Proposed Reed Canarygrass Treatment Areas (Phase 1A) .....	13
Figure 2. Proposed Conifer Underplanting Areas (Phase 1A) .....	13
Figure 3. Willow Planting Plots Completed in 2012 .....	14
Figure 4. Photographs of Willow Planting Plots in Pre-treatment Area.....	15
Figure 5. Photographs of Willow Planting Plots in Area Without Pre-treatment.....	16
Figure 6. Conifer Underplanting Areas Completed in 2012.....	17
Figure 7. Photographs of Site Preparation and Conifer Plantings .....	18
Figure 8. Photographs of Conifer Plantings .....	19

## LIST OF TABLES

Table 1. Enhancement Actions – Nooksack Delta Site Phase 1A .....	3
Table 2. Phase 1A Enhancement Actions Completed in 2012 .....	5
Table 3. Willow Plots Planted in 2012 (5% of total shrub plots) .....	8



## EXECUTIVE SUMMARY

Summary of 2012 Activities	
<b>Name of Mitigation Bank</b>	Lummi Nation Wetland and Habitat Mitigation Bank
<b>Bank Phase</b>	Phase 1A
<b>U.S. Army Corps of Engineers Reference Number</b>	NWS-2008-1519-SO
<b>Bank Sponsor</b>	Lummi Natural Resources Department
<b>Project Lead</b>	Jeremy R. Freimund, P.H.; Water Resources Manager; <a href="mailto:jeremyf@lummi-nsn.gov">jeremyf@lummi-nsn.gov</a> ; 360-312-2314
<b>Field Lead</b>	Frank Lawrence III; Natural Resource Specialist; 360-312-2309
<b>Contracted Technical Support</b>	Michael Muscari, PWS; Senior Wetland Ecologist, ESA – Northwest Biological Research Group; 206-789-9658
<b>Treatment Dates: Mowing Reed Canarygrass Areas for 2012 Planting Season</b>	Mow Area 1 (2.68 acres): July 26 – Aug. 1, 2011 Mow Area 2 (2.67 acres): Aug. 10 – Aug. 16, 2011
<b>Treatment Dates: Herbicide Application Area 1 and Area 2</b>	September 23-24, 2011
<b>Treatment Dates: Willow Planting</b>	Willow Planting Begins: April 16, 2012 Willow Planting Completed: May 15, 2012
<b>Treatment Dates: Brushing and Planting Conifers</b>	Brushing/Conifer Planting Begins: March 6, 2012 Brushing/Conifer Planting Completed: May 17, 2012

## **INTRODUCTION**

The purpose of this as-planted report is to document enhancement activities conducted during 2012 for Phase 1A of the Lummi Nation Wetland and Habitat Mitigation Bank (Bank). Phase 1A is located at the Nooksack Delta Site. This report is part of the documentation required to demonstrate attainment of the performance standards established in the Mitigation Banking Instrument (MBI). The Interagency Review Team (IRT) must review and approve the documentation as a condition of awarding and releasing additional Bank credits. The IRT award of credits will be reflected in a letter issued using IRT letterhead and signed by the IRT Chair (i.e., the U.S. Army Corps of Engineers, District Engineer or his/her designee).

Documentation of the Baseline Vegetation Conditions of the Nooksack Delta Site – Phase 1A was completed in December 2010 and accepted by the IRT. Because of the limited planting window and anticipation that the MBI would be executed during the second quarter of 2011, enhancement activities were initiated during the first quarter of 2011. These enhancement activities continued during 2012. Although the MBI was not executed until July 6, 2012, the IRT stated that the December 2010 Baseline Vegetation Conditions report would be the basis for evaluating attainment of the performance standards identified in the MBI.

## **PHASE 1A DESIGN PLAN SUMMARY**

The enhancement design for the Phase 1A Nooksack Delta Site is focused on (1) removing and managing invasive plant species; and (2) increasing native plant species richness through planting native shrubs and coniferous trees. Following the weed control effort and plantings, the primary work on the site will involve monitoring and maintenance activities.

The Nooksack Delta Site Phase 1A enhancement design is comprised of the following elements in the general sequence that they will occur:

1. Designate and protect the land within the site through a conservation easement;
2. Eradicate or control invasive species;
3. Plant native conifer species within the deciduous forests; and
4. Monitor effectiveness of treatments and underplantings, and repeat as needed to meet performance standards.

The areas designated for the different wetland enhancement measures are shown on Figures 1 and 2. Specific design elements for the enhancement areas are summarized in Table 1 and described below.

**Table 1. Enhancement Actions – Nooksack Delta Site Phase 1A**

Type of Action	Approximate Area (acres)	Approximate Area (percent)
Wetland Enhancement (knotweed removal: treatment and monitoring area)	0.9	0.2
Wetland Enhancement (weed removal/willow planting: reed canarygrass, yellow flag iris)	101.2	26.6
Wetland Enhancement (weed removal: English ivy)	2.1	0.6
Wetland Enhancement (conifer underplanting)	275.7	72.6
Total Enhancement Area	379.9	100

## BANK OBJECTIVES AND PERFORMANCE STANDARDS

The Bank's success will be measured by documenting progress toward achieving the objectives and associated performance standards identified in the MBI. The prescribed performance standards are intended to measure the success of the ecological restoration and enhancement efforts at the Bank. Only the Phase 1A performance standards related to the work performed in 2012 (Year 1) are described below.

**Objective 1:** Permanently protect aquatic ecosystem functions of the Nooksack Delta Site by instituting the MBI and implementing a conservation easement with permanent funding for site stewardship.

**Performance Standard:** The conservation easement and financial assurances are included in the MBI. The IRT approved the MBI on July 6, 2012 and the Conservation Easement was approved by all parties and recorded on October 17, 2012. The IRT released 19 credits on October 18, 2012.

**Objective 2:** Enhance ecological function by removing and managing reed canarygrass and yellow flag iris and replanting with native shrubs.

**Performance Standard:** Planting of willows in the reed canarygrass and yellow flag iris treatment area (shrub plots) completed according to IRT approved plans. Documentation of performance standard achievement provided in as-planted reports (one for each of the anticipated four planting years) showing completed planting. The as-planted reports, which must be approved by the IRT, will include a species list, plant spacing and density,

a global positioning system (GPS) map showing the center of each planting plot, and final planted acreages each year.

**Objective 3:** Enhance ecological function by removing and managing English ivy from a 2.1-acre forested area.

**Performance Standard 3A:** Cutting of English ivy and root pulling with hand tools in treatment area was completed during 2011 and described in the 2011 As-Planted Report.

**Objective 4:** Enhance long-term forested wetland ecological function and habitat for federally listed fish species (Chinook, steelhead, and bull trout) by planting conifers beneath deciduous trees in the existing forested areas and along the many stream channels.

**Performance Standard 4A:** Planting of conifers in the underplanting area completed according to IRT-approved plans. Documentation will include species list, plant spacing and density, GPS map showing the perimeter of the planted area, and final number of treated acres per year.

## **PHASE 1A WORK COMPLETED IN 2012 (YEAR 1)**

The areas where enhancement actions were completed in 2012 are shown on Figure 3 (planted shrub plots) and Figure 6 (conifer underplanting areas) and summarized in Table 2. Work completed in 2012 included planting willow stakes and planting conifer seedlings pursuant to the MBI. Although 2012 represents Year 1 for the Phase 1A site enhancement activities, because the enhancement activities are being conducted in “stages” over several years, enhancement activities conducted during 2012 represent Year 0 for Stage 2 enhancement activities. Some of the actions shown in Figures 1 and 2 as potential areas for enhancement by Year 1 were not completed during 2012 due to supply problems that precluded the planting of conifer seedlings during 2011 and contractor challenges during 2012 (e.g., insufficient manpower, equipment failures). Completion of these actions will be documented in future as-planted reports.



**Table 2. Phase 1A Enhancement Actions Completed in 2012**

Type of Wetland Enhancement Action	Area (acres)
Knotweed removal: treatment and monitoring area	0
Willow planting: reed canarygrass, yellow flag iris	29.9
Weed removal: English ivy	0
Conifer underplanting	50.5
Total Enhancement Area 2012	80.4

### **Reed Canarygrass/Yellow Flag Iris Treatment and Willow Plantings**

#### **Work Completed in 2012**

Work completed during 2012 included 29.9 acres of reed canarygrass treatment and willow plantings. Willows were planted within 679 plots each measuring approximately 20 feet in diameter. Similar to 2011, the locations for the plots planted with willow stakes in 2012 were established in a grid pattern with 40-foot on center spacing using a Geographic Information System (GIS). The latitude and longitude of each of the plots was then loaded from the GIS into a mapping grade, hand-held global positioning system (GPS) unit with a horizontal accuracy of  $\pm 2$  feet (Trimble GeoXT). The GPS unit was used to locate the plot centers in the field (see Figure 3). Each plot was designated with a unique identifier for data tracking purposes and a wood lathe with a unique identifier written on it was used to mark the plot center. Survey flagging was attached to the wood lathe to help field locate the plot centers.

The utility of mowing the essentially dormant reed canarygrass within the plots prior to planting the willow stakes was questioned during 2011 after the 2011 planting effort. Field visits during the summer of 2011 suggested qualitatively that the mowing effort had little or no effect on suppressing the reed canarygrass growth. That is, although no field measurements were collected to quantitatively evaluate the effectiveness of the mowing, the height of the reed canarygrass within the treated plots in 2011 was not visibly distinguishable from the height of the reed canarygrass between the treated plots.

Consequently, two alternative planting methods were identified for the 2012 planting season. One approach was to just plant the willow stakes within the 20-foot diameter plot boundaries without mowing first. The second approach was to treat an area with herbicide during the summer of 2011 and then plant the 20-foot diameter plots within the herbicide treated area during the spring of 2012.

As described in the 2011 As-Planted Report, 2.68 acre area of the 2012 reedcanary grass planting area was mowed using hand-held brush cutters over the July 26 through August

1, 2011 period. An additional 2.67 acre area was mowed over the August 10 through August 16, 2011 period. The acreage that was mowed was determined by walking the boundary with the Trimble GeoXT GPS unit. The approximately 5.4 acres of mowed areas were allowed to start regrowing and then both areas were treated by a licensed pesticide applicator over the September 23-24, 2011 period by spraying with the herbicide (Rodeo). The pesticide application record was provided in Appendix A of the 2011 As-Planted Report.

Planting willow stakes within the field located and marked (with wood lathe) 20-foot diameter plots began on April 16, 2012. The willow planting was delayed so that the contractor could initially focus on brushing and planting the conifer seedlings, which began on March 6, 2012. Earlier access to the site was also limited due to high river flows or unsuitable weather conditions. As shown in Figure 3, live willow stakes were planted in the 20-foot diameter plots located in the areas that had been treated with herbicide during 2011 and in the other areas targeted for Stage 2. Three species of willow stakes were planted: Pacific (*Salix lasiandra*), Sitka (*S. sitchensis*), and Hooker's (*S. hookeriana*). Stake spacing averaged 2 to 3 feet on center (approximately 57 stems per plot or 1,425 stems per acre).

Although 42,000 willow stakes were purchased, records indicate that a total of 37,791 willow stakes were planted within 679 plots in 2012 over the April 16 through May 15, 2012 period. Some of the bundles of purchased willow stakes were not adequately secured by the contractor hired to plant the stakes and were lost during a flooding event. The locations of the planted plots are shown in Figure 3. In some of the plots identified using the GIS and staked in the field, the planting density was reduced or a plot was not planted due to unsuitable planting conditions (e.g., large woody debris, deep holes/excessive water depth, bulrush, cattails) encountered in the field. Following the planting season, the planted plot locations were located in the field using the GPS and the GIS was used to draw a polygon around the planted plot locations. Using this approach, the overall treatment area for 2012 was determined to be 29.9 acres. For comparison/validation purposes, at a planting density of approximately 1,425 stems per acre the 37,791 willow stakes would be enough to treat 26.5 acres. Similarly, at an average planting density of 25 plots per acre, the 679 plots equates to a treatment area of 27.16 acres.

Because there was an apparent discrepancy between the measured treatment area and the treated area computed based on stem counts and planting density, each of the plots were field visited prior to the 2013 planting season. This additional field verification effort determined that the 29.9 acres of treated area is slightly more than the area computed based on stem counts and planting density due to the presence of open water areas or large woody debris concentrations that were unsuitable for planting within the treated area. These areas are visible in Figure 3.

Willow stakes were purchased from the Washington Conservation District plant materials center located in Skagit County (invoices and pick lists are provided in Appendix A). Figure 4 shows photographs of the planting area that received the herbicide application pre-treatment during 2011. The area planted without any pre-treatment (no herbicide application and no mowing prior to planting) is shown in Figure 5. Photographs taken in

September 2012 show several inches of growth for willows planted in both areas during the months following planting.

### *Willow Plot Sampling*

Performance standards for the willow planting plots include: documentation of planting in Year 0 (this report), shrub aerial cover starting with a minimum of 10% in Year 1, and an increase in the diameter of the plots beginning in Year 7. When approved by the IRT, this as-planted report satisfies the Year 0 performance standards specified in Table C.2 of the MBI.

In order to provide a basis of comparison for the future diameters of the plots, the diameter of randomly selected plots was measured as described in the Mitigation Banking Instrument for Year 0 (2012). The GIS was used to randomly sample/select 37 of the plots (a little over 5% of total) for shrub cover and plot diameter measurements. Two of the randomly selected monitoring plots were determined in the field to be unsuitable for monitoring. One of these two plots (No. 152) was sampled but it was determined that approximately half of the plot was bulrush. The second of the two plots (No. 835) was not planted due to large woody debris. The remaining 35 plots selected for sampling and monitoring are shown in orange on Figure 3. The plot locations will also serve as permanent photo points; four photographs will be taken at each plot during future monitoring.

Three measurements of the plot diameter were made at each sample plot and averaged for each plot. Baseline diameter measurements were taken near the end of the growing season (September 2012) using a fiberglass tape stretched through the center of the plot (marked with wood lathe) and were made from the outermost portion of the willow stems. Shrub cover was estimated to average 5.4% with a standard error (SE) of 1.52 over the 35 plots monitored at the end of the Year 0 (2012) growing season.

There were an insufficient number of live willow stakes to measure a diameter at 2 of the 35 plots. This unforeseen circumstance was discussed with the IRT during a June 27, 2013 meeting and resolved. In essence, Appendix F (Section F.2.3.2) of the MBI defines the baseline for the willow patches that are being planted to enhance wetland areas invaded by reed canarygrass as the diameter of the patches after the first few months of growth following the initial planting. As a result, to determine if the performance standards related to the size of the shrub patches are achieved (i.e., a 10 percent increase in patch diameter), the future target patch diameters must be calculated against a different baseline diameter value for each individual monitoring patch. For most of the willow patches, the average baseline diameter (which is determined by averaging three different diameter measurements [north-south, east-west, and northwest-southeast] through the center of the patch and to the outer overhanging branches) was non-zero and the resultant baseline diameter plus 10 percent is used as the threshold for that patch (as intended by the MBI).

All of the patches that were randomly selected and measured as part of the 2011 plantings had non-zero diameters. However, as part of the baseline measurements of the randomly selected willow patches for the 2012 enhancement activities, two patches were encountered where all of the planted willows were dead. The cause of the dead willows

in these two randomly selected patches was attributed to a variety of factors (e.g., voles, potential mis-handling of the willow stakes prior to planting, late planting). Regardless of the cause, the result is a baseline patch diameter of zero for these patches. Because these monitoring plots are randomly selected from the treatment patches for a particular year, selecting an alternative “non-zero” patch is not an option without introducing bias into the sampling protocols. Similarly, in addition to mathematical difficulties that arise when attempting to divide by zero, a 10 percent increase in an initial patch diameter of zero is zero, which is an unsuitable indicator of successful performance.

For the rare situations where randomly selected monitoring patches are measured to have a zero baseline diameter, the IRT agreed that the average baseline patch diameter for the non-zero patches that were planted in the same year be used instead of the zero (note that the baseline average is calculated after excluding any patches with a zero-valued baseline measurement). The IRT formally approved this methodology in an August 21, 2013 email.

The overall mean diameter of the 33 willow non-zero plots sampled in September 2012 was 17.9 feet (error for between plot diameter 3.4%). The Year 0 diameter for the 35 monitoring plots and the target diameters for each monitoring plot are shown in Table 3.

The 35 sample plots are designated as permanent plots. The mean diameter for each individual plot will be the baseline used to compare with the mean diameter measured in Years 7 and 10. The average plot diameter will be used as the baseline measurement for the two plots that will need to be replanted. Performance standards for Year 7 include a 10% minimum increase in plot diameter for at least one-quarter of the plots. The minimum target diameters for each of the plots in Year 7 are shown in Table 3. Additional details, including error measurements are in Appendix C.

**Table 3. Willow Plots Planted in 2012 (5% of total shrub plots)**

<b>Station Name</b>	<b>Mean Diameter in Year 0 (ft)</b>	<b>Target Diameter (+10%) by Year 7 (ft)</b>
WP0012	21.1	23.2
WP0036	15.1	16.7
WP0038	21.5	23.7
WP0054	20.5	22.6
WP0127	20.4	22.5
WP0155	18.2	20.0
WP0171	18.8	20.7
WP0174	21.4	23.5
WP0198	19.2	21.1
WP0221	11.9	13.1
WP0229	11.9	13.1
WP0272	17.5	19.3
WP0282	19.4	21.3

Station Name	Mean Diameter in Year 0 (ft)	Target Diameter (+10%) by Year 7 (ft)
WP0333	14.7	16.1
WP0351	20.4	22.5
WP0353	18.1	20.0
WP0379	21.8	24.0
WP0463	23.4	25.8
WP0726	20.4	22.4
WP0750	21.31	23.44
WP0873	11.6	12.8
WP0882	20.3	22.3
WP1009	20.4	22.4
WP1034	19.3	21.3
WP1053	21.2	23.3
WP1080	22.0	24.2
WP1106	22.0	24.2
WP1109	20.9	22.9
WP1124	21.3	23.4
WP1164	0.0 (17.9)	19.7
WP1166	0.0 (17.9)	19.7
WP1167	17.8	19.5
WP1179	20.5	22.6
WP1193	22.5	24.7
WP1200	21.4	23.5

## **Conifer Underplanting**

### **Work Completed in 2012**

Conifers were planted within deciduous forest areas shown on Figure 6. The conifer planting areas were prepared by cutting down competing shrub vegetation using hand-operated, gas powered steel bladed brush cutters. Plant material invoices, email correspondence with the vendor, and pick lists (see Appendix A) reflect that an initial order that totaled 36,400 bare root conifer seedlings (27,300 Western Red Cedar [75%], 9,100 Sitka Spruce [25%]) was voluntarily reduced by 5,050 Western Red Cedar seedlings so that another customer's order could be filled. The cost of these trees was credited to the Lummi Natural Resources Department account to support the plant material costs for the 2013 planting season. As a result of this reduction, and as reflected in the pick lists included in Appendix A, a total of 31,350 bare root conifer seedlings (22,250 Western Red Cedar [71%], 9,100 Sitka Spruce [29%]) were purchased. Planting and billing records from the contractor indicate that a total of 30,535 bare root trees were planted (97.4%). Similar to the willow planting area, following the planting season the

perimeter of the planted area was located in the field using the GPS and the GIS was used to draw a polygon around the planted area. Using this approach, the overall conifer underplanting treatment area for 2012 was determined to be 50.5 acres. For comparison/validation purposes, at a planting density of approximately 260 seedlings per acre, the 30,535 seedlings would be enough to treat 120.6 acres. Planting occurred during the March 6, 2012 through May 17, 2012 period. Representative photographs of the conifer plantings are included in Figures 7 and 8.

### **Conifer Sampling Transects**

Monitoring was conducted along the 39 transects shown in Figure 6 during the September 28 through October 12, 2012 period to provide a baseline (Year 0) assessment of tree density, height, and overall health. The start and endpoints of each transect were located using GPS and marked in the field with wood lath. Photographs were taken at each end of each transect and also of at least one representative tree along each transect. Live conifer saplings within a 6-foot-wide “belt” centered on each transect were counted to sample the tree population. The mean density of conifers was measured to be 587 per acre (SE 34), based on 39 transects. The average tree height was 2.2 feet (SE 0.02) based on measurements of 463 individual trees.

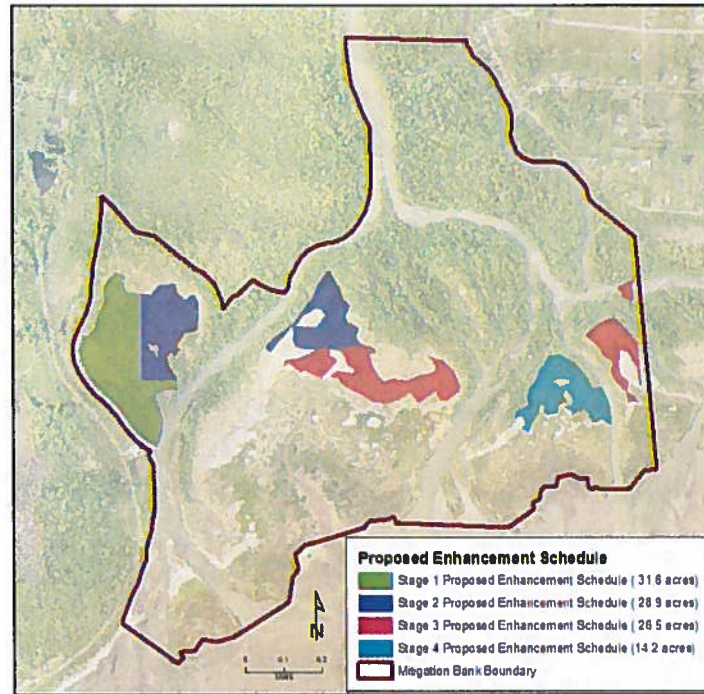
### **Knotweed Control**

The existing knotweed occurrences along the riverbanks were located with GPS in late summer 2012 to provide an updated existing conditions map. Knotweed control efforts have not begun on the Bank site. Alternative knotweed control methods are being evaluated and are expected to be implemented in 2014.

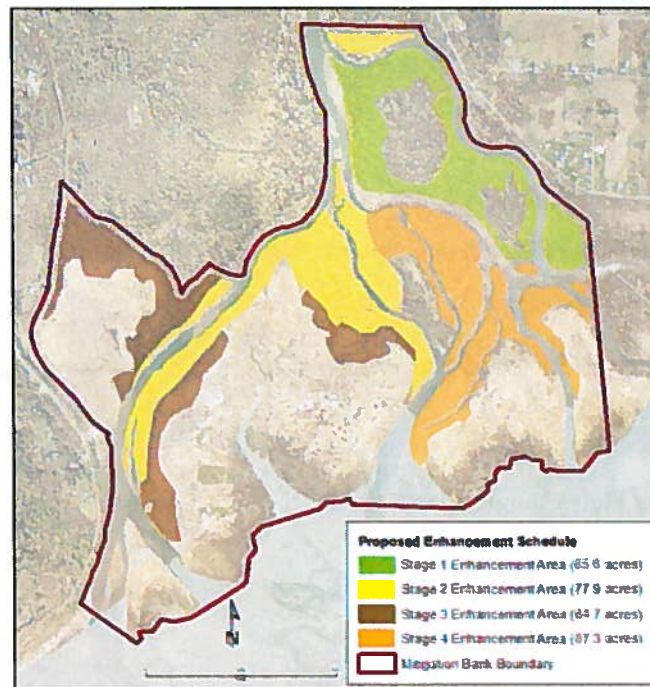
## **FIGURES**







**Figure 1. Proposed Reed Canarygrass Treatment Areas (Phase 1A)**



**Figure 2. Proposed Conifer Underplanting Areas (Phase 1A)**

Figures 1 and 2 are presented for reference to the proposed 4-year enhancement schedule. Full sized images and further details are provided in the MBI.

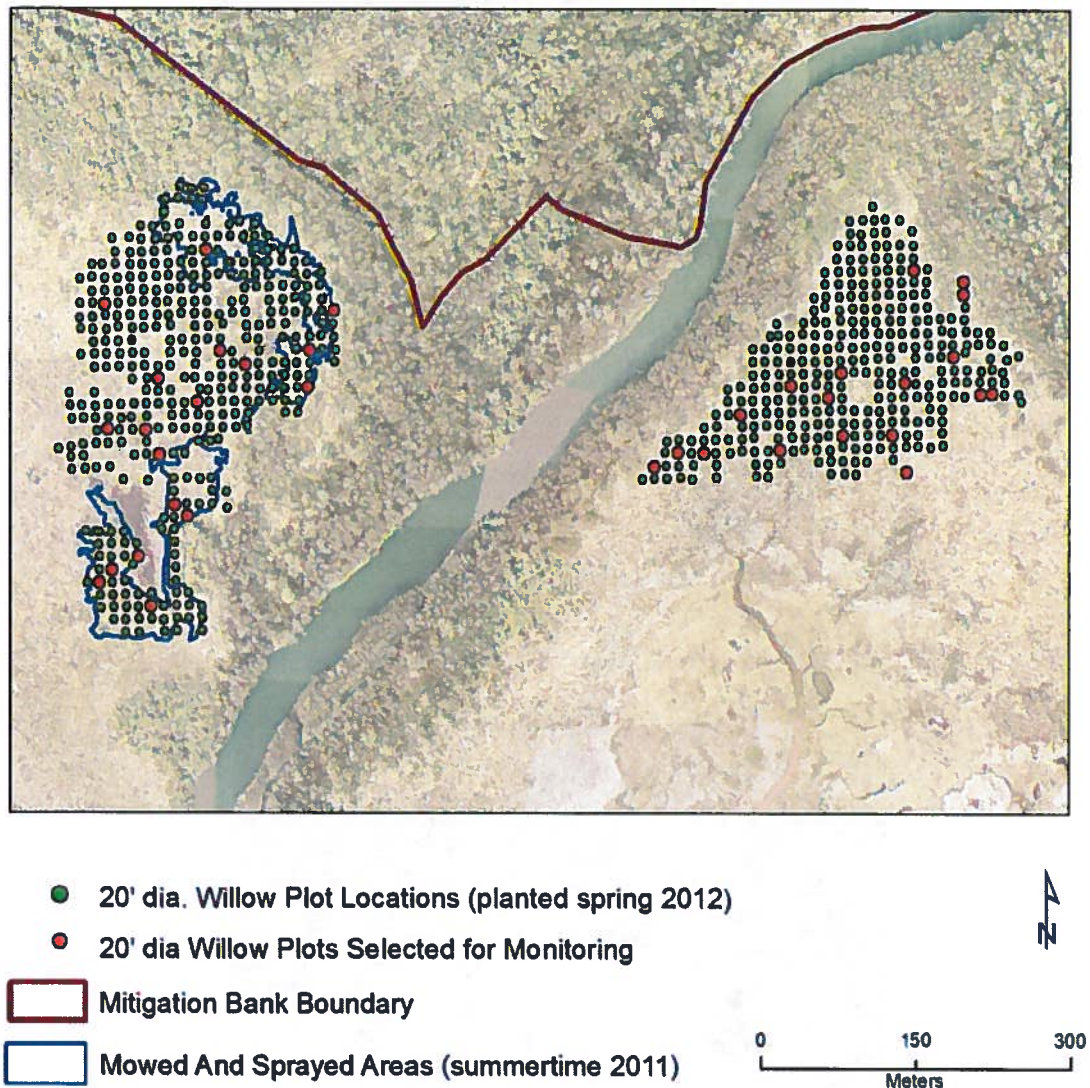


Figure 3. Willow Planting Plots Completed in 2012





Photograph taken in September 2012 showing a typical willow planting plot in area that received pre-treatment (mowing and herbicide application during the summer of 2011).



Photograph taken in September 2012 showing several inches of new growth on willow stake planted in area with pre-treatment.

**Figure 4. Photographs of Willow Planting Plots in Pre-treatment Area**





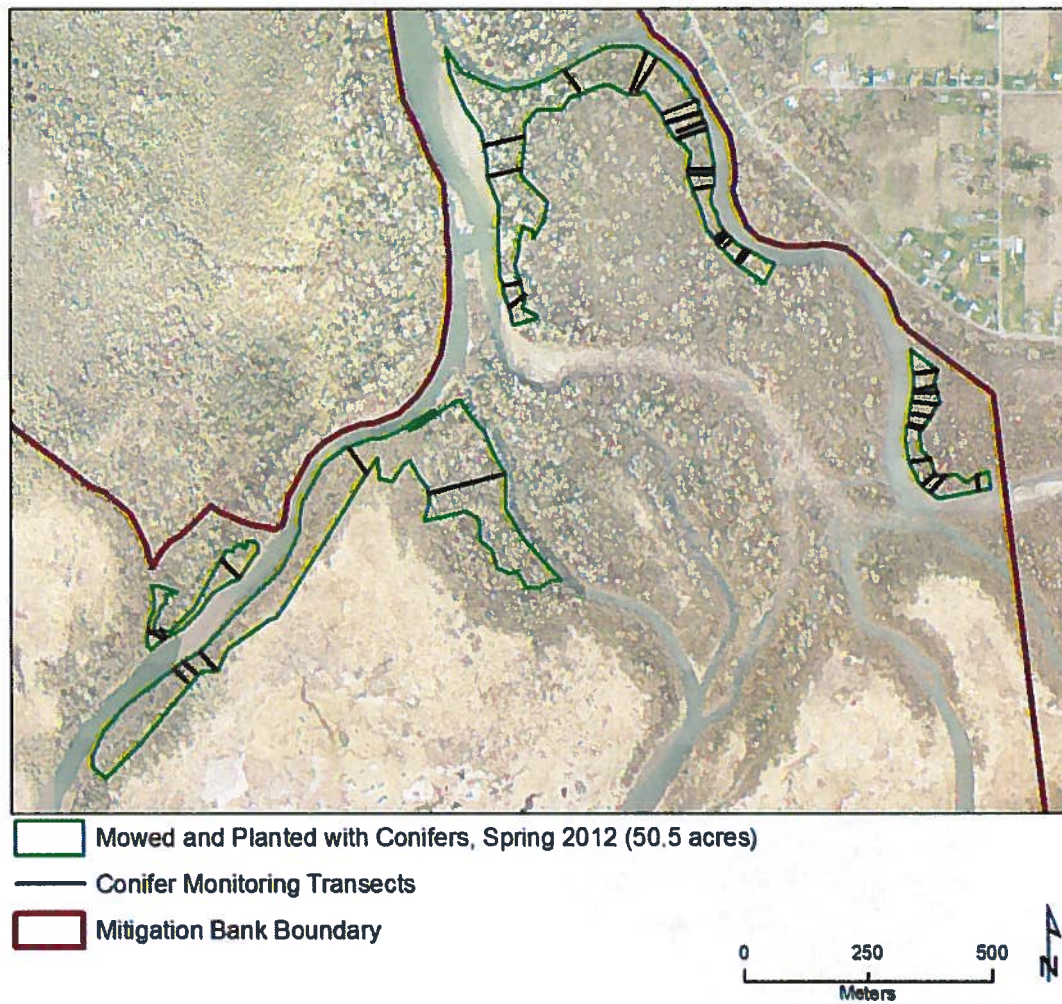
Photograph taken in September 2012 showing a typical willow planting plot in area without reed canarygrass pre-treatment. Blue flagging on wood lath in center of photo marks the center of the 20-foot-diameter plot. Willow stakes are spaced on average 2 to 3 feet on center.



Typical willow growth in area without reed canarygrass pre-treatment in September 2012.

**Figure 5. Photographs of Willow Planting Plots in Area Without Pre-treatment**





**Figure 6. Conifer Underplanting Areas Completed in 2012**



Brushing activities in preparation for conifer planting in March 2012.



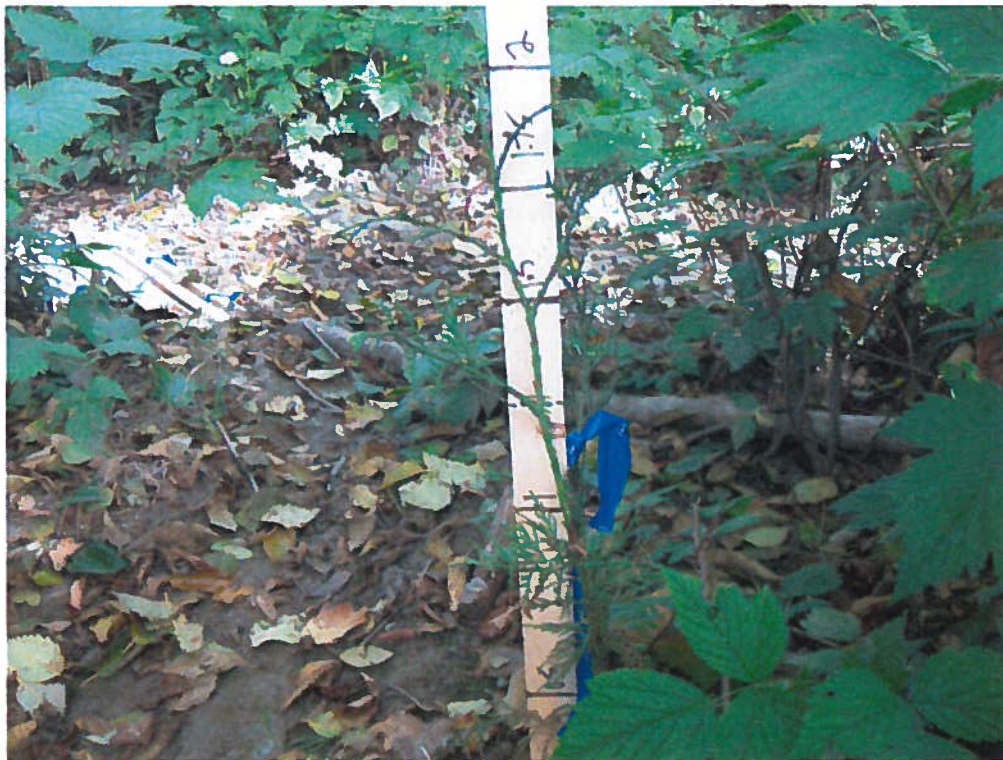
Conifer planting in March 2012.

**Figure 7. Photographs of Site Preparation and Conifer Plantings**





Sitka spruce planted March 2012 in conifer underplanting area. Approximately 0.75 foot of new growth can be seen in photograph taken September 2012.



Western red cedar planted March 2012 in conifer underplanting area. Approximately 1 foot of new growth can be seen in photo taken in September 2012.

**Figure 8. Photographs of Conifer Plantings**





## **APPENDIX A: INVOICES**



# WACD Plant Materials Center

16564 Bradley Road  
Bow, WA 98232  
USA

# SALES ORDER

Sales Order Number: 12-019  
Sales Order Date: May 17, 2011  
Page: 1

Voice: 360-757-1094  
Fax: 360-757-3923  
Email: wacd@ncia.com

## To:

Lummi Natural Resources - Lawrence, F  
Attn: Frank Lawrence  
2616 Kwina Road  
Bellingham, WA 98226

## Ship To:

Lummi Natural Resources - Frank L  
Attn: Frank Lawrence  
2616 Kwina Road  
Bellingham, WA 98226

Customer ID	PO Number	Sales Rep Name
L1240.2		Jacqueline M. Gauthier
Customer Contact	Customer Phone Number	Payment Terms
Frank Lawrence	360-384-2329	Net 30 Days

Quantity	Description	Unit Price	Amount
10,000	C-Western Red Cedar (Thuja plicata) 201-0.5, P-1, 12"+ (25)	0.61	6,100.00
17,300	C-Western Red Cedar (Thuja plicata) BC, P-1, 12"+ (25)	0.61	10,553.00
9,100	C-Sitka Spruce (Picea sitchensis) BC, P-1, 12"+ (25)	0.61	5,551.00
1	25% Deposit		

36,400  
→ 13,650  
22,750 trees → \$13,677.50

→ Original sales order for:  
22,300 Western red cedar  
9,100 Sitka spruce  
36,400 conifers

→ Per March 27-28 email stating, order reduced by 5,050 Western red cedar and account credited for the 2013 planting season.

→ Total Purchase for 2012 planting season:  
22,250 Western Red Cedar  
9,100 Sitka Spruce  
31,350 conifers

Subtotal	22,204.00
Sales Tax	
Freight	0.00
<b>TOTAL ORDER AMOUNT</b>	<b>22,204.00</b>

**WACD Plant Materials Center**

16564 Bradley Road  
Bow, WA 98232  
USA

**INVOICE**

Invoice Number: 12-019-D  
Invoice Date: May 17, 2011  
Page: 1

Voice: 360-757-1094  
Fax: 360-757-3923

**Bill To:**

Lummi Natural Resources - Lawrence, F  
Attn: Frank Lawrence  
2616 Kwina Road  
Bellingham, WA 98226

**Ship to:**

Lummi Natural Resources - Frank L  
Attn: Frank Lawrence  
2616 Kwina Road  
Bellingham, WA 98226

Customer ID	Customer PO	Payment Terms	
L1240.2		Net 30 Days	
Sales Rep ID	Shipping Method	Ship Date	Due Date
GauthierJ	Best Way		6/16/11

Quantity	Description	Unit Price	Amount
1.00	25% Deposit	5,550.00	5,550.00
<p>OK to pay seedlings - Deposit on seedlings P.O. # 120896 Jenny Freeland 6/28/2011</p>			

Check/Credit Memo No:

Subtotal	5,550.00
Sales Tax	
Total Invoice Amount	5,550.00
Payment/Credit Applied	
<b>TOTAL</b>	<b>5,550.00</b>

**WACD Plant Materials Center**

16564 Bradley Road  
Bow, WA 98232  
USA

**INVOICE**

Invoice Number: 12-019-D2  
Invoice Date: Dec 12, 2011  
Page: 1

Voice: 360-757-1094

Fax: 360-757-3923

<b>Bill To:</b>
Lummi Natural Resources - Lawrence, F Attn: Frank Lawrence 2616 Kwina Road Bellingham, WA 98226

<b>Ship to:</b>
Lummi Natural Resources - Frank L Attn: Frank Lawrence 2616 Kwina Road Bellingham, WA 98226

Customer ID	Customer PO	Payment Terms	
L1240.3		Net 30 Days	
Sales Rep ID	Shipping Method	Ship Date	Due Date
GauthierJ	Best Way		1/11/12

Quantity	Description	Unit Price	Amount
1.00	25% Deposit	8,500.00	8,500.00

*OK to pay - Deposit on seedlings*  
*P.O. # 125744*  
*Jeremy Trimmer*  
*2/16/2012*

Check/Credit Memo No:

Subtotal	8,500.00
Sales Tax	
Total Invoice Amount	8,500.00
Payment/Credit Applied	
<b>TOTAL</b>	<b>8,500.00</b>

**WACD Plant Materials Center**

16564 Bradley Road  
Bow, WA 98232  
USA

**INVOICE**

Invoice Number: 12-019-D3  
Invoice Date: Dec 14, 2011  
Page: 1

Voice: 360-757-1094

Fax: 360-757-3923

**Bill To:**

Lummi Natural Resources - Lawrence, F  
Attn: Frank Lawrence  
2616 Kwina Road  
Bellingham, WA 98226

**Ship to:**

Lummi Natural Resources - Frank L  
Attn: Frank Lawrence  
2616 Kwina Road  
Bellingham, WA 98226

Customer ID	Customer PO	Payment Terms	
L1240.3		Net 30 Days	
Sales Rep ID	Shipping Method	Ship Date	Due Date
GauthierJ	Best Way		1/13/12

Quantity	Description	Unit Price	Amount
1.00	25% Deposit	8,154.00	8,154.00

*OK to  
Pay-Deposit on samplings  
P.O. # 125909  
Jeremy Zimm  
2/16/2012*

Check/Credit Memo No:

Subtotal	8,154.00
Sales Tax	
Total Invoice Amount	8,154.00
Payment/Credit Applied	
<b>TOTAL</b>	<b>8,154.00</b>

## Jeremy Freimund

---

**From:** Jacquie Gauthier [pmcsales@clearwire.net]  
**Sent:** Wednesday, March 28, 2012 8:22 AM  
**To:** Frank Lawrence III  
**Cc:** Jeremy Freimund  
**Subject:** RE: 5,000 Western Red Cedars

Great thanks Frank. Just so you know the way the numbers worked out you have 1000 less WRC 201's and 4050 less WRC BC's a total of 5050 from your order. I will work with Lori and the amount credited to your account. I will also keep in mind customers looking for the species you have surplus of. Thanks!

*Jacquie Gauthier*

Sales Manager  
WACD Plant Material Center  
16564 Bradley Rd  
Bow WA 98232  
☎: 360-757-1094  
✉: [pmcsales@clearwire.net](mailto:pmcsales@clearwire.net)  
🌐: [www.wadistricts.org](http://www.wadistricts.org)

---

**From:** Frank Lawrence III [mailto:[FrankL@lummi-nsn.gov](mailto:FrankL@lummi-nsn.gov)]  
**Sent:** Wednesday, March 28, 2012 8:18 AM  
**To:** Jacquie Gauthier  
**Cc:** Jeremy Freimund  
**Subject:** RE: 5,000 Western Red Cedars

Jacquie,

Good morning and I hope all is well. Thank you for the help and please be advised that the door is still open for other foresters needing additional trees. I don't know exactly how many trees we are going to need next year, can we credit the amount for the 5,000 trees to our account until we place our order? Thanks.

*Qwa Shus*

Frank Lawrence III, Water Resources Planner I  
Lummi Natural Resources Department  
2616 Kwina Road  
Bellingham, WA 98226  
[frankl@lummi-nsn.gov](mailto:frankl@lummi-nsn.gov)  
Bus: (360) 384-2329

---

**From:** Jacquie Gauthier [mailto:[pmcsales@clearwire.net](mailto:pmcsales@clearwire.net)]  
**Sent:** Wednesday, March 28, 2012 7:50 AM  
**To:** Frank Lawrence III  
**Subject:** RE: 5,000 Western Red Cedars

Great we will make the change and it's my understanding you would like to order 5000 for next year?

*Jacquie Gauthier*

Sales Manager  
WACD Plant Material Center  
16564 Bradley Rd  
Bow WA 98232  
☎: 360-757-1094  
✉: [pmcsales@clearwire.net](mailto:pmcsales@clearwire.net)  
: [www.wadistricts.org](http://www.wadistricts.org)

---

**From:** Frank Lawrence III [<mailto:FrankL@lummi-nsn.gov>]  
**Sent:** Tuesday, March 27, 2012 5:12 PM  
**To:** Jacquie Gauthier  
**Cc:** Jeremy Freimund  
**Subject:** 5,000 Western Red Cedars

Jacquie,

I received your message about a forester that is interested in purchasing 5,000 Western Red Cedars. Per our phone discussion this morning (March 27, 2012) Jeremy and I agree for you to sell 5,000 of our cedars to the forester in need. We would like to credit the amount of the 5,000 cedars to next year's tree purchase. Please let us know if the forester is going to purchase. My work phone number is 360-384-2329 and Jeremy's is 360-384-2212. Thank you and have a good evening.

*Qwa Shus*

Frank Lawrence III, Water Resources Planner I  
Lummi Natural Resources Department  
2616 Kwina Road  
Bellingham, WA 98226  
[frankl@lummi-nsn.gov](mailto:frankl@lummi-nsn.gov)  
Bus: (360) 384-2329



## WACD Plant Materials Center

## Picklist Report

As of Apr 9, 2012

Filter Criteria includes: 1) Sales Order Numbers from 12-001 to 12-500, 2) Customer IDs from L1240 to L1240.3; 3) Includes Drop Shipments; 4) Net Quantity. Report order is by Customer ID. Report is printed in Detail Format.

Customer Customer ID Sales Order Number	Qty on Or	Line Description
Lummi Natural Resources - Lawrence L1240.3 12-019	11500.00 <u>11500</u> 6200.00 <u>6200</u>	Western Red Cedar (Thuja plicata) 201-0.5, P-1, 12"+ (25) Sitka Spruce (Picea sitchensis) BC, P-1, 12"+ (25)
	17700.00	
Lummi Natural Resources - Lawrence L1240.3 12-311	10500.00 <u>5200.00</u> 5300.00	Hooker Willow (Salix hookeriana) WW, 36" cutting Sitka Willow (Salix sitchensis) WW, 36" cutting Pacific Willow (Salix lasiandra) WW, 36" cutting
	21000.00	
Lummi Natural Resources - Lawrence L1240.3 12-314	10500.00 <u>5300.00</u> 5200.00	Hooker Willow (Salix hookeriana) WW, 36" cutting Sitka Willow (Salix sitchensis) WW, 36" cutting Pacific Willow (Salix lasiandra) WW, 36" cutting
	21000.00	

*Frank Lawrence*  
4-10-12

## WACD Plant Materials Center

16564 Bradley Road  
Bow, WA 98232  
USA

Voice: 360-757-1094  
Fax: 360-757-3923  
Email: wacd@ncia.com

# SALES ORDER

Sales Order Number: 12-311  
Sales Order Date: Feb 15, 2012  
Page: 1

**To:**

Lummi Natural Resources - Lawrence, F  
Attn: Frank Lawrence  
2616 Kwina Road  
Bellingham, WA 98226

**Ship To:**

Lummi Natural Resources - Frank L  
Attn: Frank Lawrence  
2616 Kwina Road  
Bellingham, WA 98226

Customer ID	PO Number	Sales Rep Name
L1240.3		Jacqueline M. Gauthier
Customer Contact	Customer Phone Number	Payment Terms
Frank Lawrence	360-384-2329	Net 30 Days

Quantity	Description	Unit Price	Amount
10,500	Hooker Willow (Salix hookeriana) WW, 36" cutting	0.61	6,405.00
5,200	Sitka Willow (Salix sitchensis) WW, 36" cutting	0.61	3,172.00
5,300	Pacific Willow (Salix lasiandra) WW, 36" cutting	0.61	3,233.00

Subtotal	12,810.00
Sales Tax	
Freight	0.00
<b>TOTAL ORDER AMOUNT</b>	<b>12,810.00</b>

## WACD Plant Materials Center

## Picklist Report

As of Feb 29, 2012

Filter Criteria includes: 1) Customer IDs from L1220 to L1240.4; 2) Includes Drop Shipments; 3) Net Quantity. Report order is by Customer ID. Report is printed in Detail Format.

Customer Customer ID Sales Order Number	Qty on Or	Line Description
Lummi Natural Resources - Lawrenc L1240.3 12-019	12500.00 14800.00 9100.00 1.00	Western Red Cedar (Thuja plicata) 201-0.5, P-1, 12"+ (25) Western Red Cedar (Thuja plicata) BC, P-1, 12"+ (25) Sitka Spruce (Picea sitchensis) BC, P-1, 12"+ (25) 25% Deposit
	36401.00	
Lummi Natural Resources - Lawrenc L1240.3 12-311	10500.00 5200.00 5300.00	Hooker Willow (Salix hookeriana) WW, 36" cutting Sitka Willow (Salix sitchensis) WW, 36" cutting Pacific Willow (Salix lasiandra) WW, 36" cutting
	21000.00	
Lummi Natural Resources - Lawrenc L1240.3 12-314	10500.00 5300.00 5200.00	Hooker Willow (Salix hookeriana) WW, 36" cutting Sitka Willow (Salix sitchensis) WW, 36" cutting Pacific Willow (Salix lasiandra) WW, 36" cutting
	21000.00	
Lummi Natural Resources - Phair, C L1240.4 12-223	1000.00 500.00 250.00 150.00 100.00 100.00 400.00	Alaska Yellow Cedar (Chamaecyparis nootkatensis) BC, P-1, 12" (25) Shore Pine (Pinus contorta "contorta") 053-0.5, 2-0, 12"+ (25) Paper Birch (Betula papyrifera) WW, 2-0, 18"+ (10) Pacific Crabapple (Malus fusca) OR, 2-0, 18"+ (10) Twinberry (Lonicera involucrata) WW, 1-0, 12"+ (50) Scoulers Willow (Salix scouleriana) WW, 36" cutting Sitka Spruce (Picea sitchensis) 030-0.5, 2-0, 12"+ (25)
	2500.00	
Lummi Natural Resources - Phair, C L1240.4 12-344	20.00 10.00 20.00 50.00 25.00	Big Leaf Maple (Acer macrophyllum) WW, 1-0, 18"+ (10) Mock Orange (Philadelphus lewisii) EW, 2-0, 6-12" (10) Pacific Crabapple (Malus fusca) WW, 2-0, 6-18" (10) Salmonberry (Rubus spectabilis) WW, 1-0, 6-12" (50) Sitka Spruce (Picea sitchensis) BC, 2-0, 6-12" (25)
	125.00	

$$150 \times 61 = 9150 + 1600 = 10,750$$

|||||

$$200 \times 8 = 1600$$

|||||

$$9400 / 21.400 = .26$$

## WACD Plant Materials Center

## Picklist Report

As of Mar 1, 2012

Filter Criteria includes: 1) Sales Order Numbers from 12-001 to 12-500; 2) Customer IDs from L1220 to L1240.4; 3) Includes Drop Shipments; 4) Net Quantity.  
Report order is by Customer ID. Report is printed in Detail Format.

Customer Customer ID Sales Order Number	Qty on Or	Line Description
Lummi Natural Resources - Lawrenc	12500.00	Western Red Cedar (Thuja plicata) 201-0.5, P-1, 12"+ (25)
L1240.3	4050.00	Western Red Cedar (Thuja plicata) BC, P-1, 12"+ (25)
12-019	9100.00	Sitka Spruce (Picea sitchensis) BC, P-1, 12"+ (25)
	1.00	25% Deposit
	25651.00	
Lummi Natural Resources - Lawrenc	10500.00	Hooker Willow (Salix hookeriana) WW, 36" cutting
L1240.3	5200.00	Sitka Willow (Salix sitchensis) WW, 36" cutting
12-311	5300.00	Pacific Willow (Salix lasiandra) WW, 36" cutting
	21000.00	
Lummi Natural Resources - Lawrenc	10500.00	Hooker Willow (Salix hookeriana) WW, 36" cutting
L1240.3	5300.00	Sitka Willow (Salix sitchensis) WW, 36" cutting
12-314	5200.00	Pacific Willow (Salix lasiandra) WW, 36" cutting
	21000.00	
Lummi Natural Resources - Phair, C	1000.00	Alaska Yellow Cedar (Chamaecyparis nootkatensis) BC, P-1, 12" (25)
L1240.4	500.00	Shore Pine (Pinus contorta "contorta") 053-0.5, 2-0, 12"+ (25)
12-223	250.00	Paper Birch (Betula papyrifera) WW, 2-0, 18"+ (10)
	150.00	Pacific Crabapple (Malus fusca) OR, 2-0, 18"+ (10)
	100.00	Twinberry (Lonicera involucrata) WW, 1-0, 12"+ (50)
	100.00	Scoulers Willow (Salix scouleriana) WW, 36" cutting
	400.00	Sitka Spruce (Picea sitchensis) 030-0.5, 2-0, 12"+ (25)
	2500.00	
Lummi Natural Resources - Phair, C	20.00	Big Leaf Maple (Acer macrophyllum) WW, 1-0, 18"+ (10)
L1240.4	10.00	Mock Orange (Philadelphus lewisii) EW, 2-0, 6-12" (10)
12-344	20.00	Pacific Crabapple (Malus fusca) WW, 2-0, 6-18" (10)
	50.00	Salmonberry (Rubus spectabilis) WW, 1-0, 6-12" (50)
	25.00	Sitka Spruce (Picea sitchensis) BC, 2-0, 6-12" (25)
	125.00	

Final  
Lawrence  
13,650  
Total

**WACD Plant Materials Center**

16564 Bradley Road  
Bow, WA 98232  
USA

**INVOICE**

Invoice Number: 12-311-Final

Invoice Date: Apr 16, 2012

Page: 1

Voice: 360-757-1094

Fax: 360-757-3923

**Bill To:**

Lummi Natural Resources - Lawrence, F  
Attn: Frank Lawrence  
2616 Kwina Road  
Bellingham, WA 98226

**Ship to:**

Lummi Natural Resources - Frank L  
Attn: Frank Lawrence  
2616 Kwina Road  
Bellingham, WA 98226

Customer ID	Customer PO	Payment Terms	
L1240.3	127238	Net 30 Days	
Sales Rep ID	Shipping Method	Ship Date	Due Date
GauthierJ	Best Way		5/16/12

Quantity	Description	Unit Price	Amount
10,500.00	Hooker Willow (Salix hookeriana) WW, 36" cutting	0.61	6,405.00
5,200.00	Sitka Willow (Salix sitchensis) WW, 36" cutting	0.61	3,172.00
5,300.00	Pacific Willow (Salix lasiandra) WW, 36" cutting	0.61	3,233.00
<p>O.K. to Pay - see attached Picklist Report by - Picked up by Frank Lawrence on 4/13/2012 Jeremy Freeman 4/30/2012</p>			

Check/Credit Memo No:

Subtotal	12,810.00
Sales Tax	
Total Invoice Amount	12,810.00
Payment/Credit Applied	
<b>TOTAL</b>	<b>12,810.00</b>

## WACD Plant Materials Center

## Picklist Report

As of Apr 11, 2012

Filter Criteria includes: 1) Sales Order Numbers from 12-001 to 12-500; 2) Customer IDs from L1220 to L1240.3; 3) Includes Drop Shipments; 4) Net Quantity. Report order is by Customer ID. Report is printed in Detail Format.

Customer Customer ID Sales Order Number	Qty on Or	Line Description
Lummi Natural Resources - Lawrenc	10500.00	Hooker Willow (Salix hookeriana) WW, 36" cutting
L1240.3	5200.00	Sitka Willow (Salix sitchensis) WW, 36" cutting
12-311	5300.00	Pacific Willow (Salix lasiandra) WW, 36" cutting
	21000.00	
Lummi Natural Resources - Lawrenc	10500.00	Hooker Willow (Salix hookeriana) WW, 36" cutting
L1240.3	5300.00	Sitka Willow (Salix sitchensis) WW, 36" cutting
12-314	5200.00	Pacific Willow (Salix lasiandra) WW, 36" cutting
	21000.00	

5,250 #  
2,1600 #  
2,650 #  
2,1400 #  
Picked up both

Frank Lawrence  
4/13/12

1st sight

P IIII IIII IIII IIII IIII (27)

H (53)

S (26)

## **APPENDIX B: YEAR 0 SHRUB PLOT DIAMETERS**





Shrub Planting Plots Sampled at Nooksack Delta Phase 1A Site for 2012 Planting Stage  
(5% of Total Shrub Patches)

Station Name	Stage Name	Mean Diameter	Count Of Metric	Standard Deviation	Standard Error	Baseline	Alternative Baseline	Target Diameter
WP0012	Baseline	21.08	3	0.8	0.27	21.08		23.19
WP0036	Baseline	15.14	3	13.22	4.41	15.14		16.65
WP0038	Baseline	21.5	3	0.79	0.26	21.5		23.65
WP0054	Baseline	20.53	3	0.21	0.07	20.53		22.58
WP0127	Baseline	20.44	3	0.88	0.29	20.44		22.48
WP0155	Baseline	18.2	3	1.98	0.66	18.2		20.02
WP0171	Baseline	18.78	3	3.39	1.13	18.78		20.66
WP0174	Baseline	21.39	3	0.1	0.03	21.39		23.53
WP0198	Baseline	19.22	3	0.29	0.1	19.22		21.14
WP0221	Baseline	11.89	3	10.46	3.49	11.89		13.08
WP0229	Baseline	11.89	3	10.39	3.46	11.89		13.08
WP0272	Baseline	17.5	3	5.02	1.67	17.5		19.25
WP0282	Baseline	19.36	3	2.41	0.8	19.36		21.3
WP0333	Baseline	14.67	3	12.74	4.25	14.67		16.14
WP0351	Baseline	20.42	3	0.71	0.24	20.42		22.46
WP0353	Baseline	18.14	3	4.2	1.4	18.14		19.95
WP0379	Baseline	21.83	3	0.87	0.29	21.83		24.01
WP0463	Baseline	23.42	3	0.44	0.15	23.42		25.76
WP0726	Baseline	20.39	3	0.27	0.09	20.39		22.43
WP0750	Baseline	21.31	3	0.82	0.27	21.31		23.44
WP0873	Baseline	11.64	3	11.42	3.81	11.64		12.8
WP0882	Baseline	20.25	3	1.34	0.45	20.25		22.28
WP1009	Baseline	20.39	3	2.36	0.79	20.39		22.43
WP1034	Baseline	19.33	3	0.59	0.2	19.33		21.26
WP1053	Baseline	21.17	3	1.66	0.55	21.17		23.29
WP1080	Baseline	21.97	3	0.29	0.1	21.97		24.17
WP1106	Baseline	22	3	0.14	0.05	22		24.2
WP1109	Baseline	20.86	3	0.65	0.22	20.86		22.95
WP1124	Baseline	21.28	3	0.62	0.21	21.28		23.41
WP1164	Baseline	0	3	0	0	0	17.94	19.73
WP1166	Baseline	0	3	0	0	0	17.94	19.73
WP1167	Baseline	17.75	3	4.77	1.59	17.75		19.53
WP1179	Baseline	20.53	3	1.17	0.39	20.53		22.58
WP1193	Baseline	22.45	3	1.49	0.5	22.45		24.7
WP1200	Baseline	21.39	3	0.13	0.04	21.39		23.53

